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(54) Disk brake caliper with separat cooling fluid circuit

(57) A caliper for disk brakes for high-performance cars, which has a high degree of reliability, comprises a body (2) having two side portions (3, 4) and two transverse bridges (5, 6) connecting the two side portions, cylinder-piston units (7-14) arranged along each side portion, and a circuit (17) for a fluid for cooling the cylinder-piston units, the circuit (17) comprising wells (20-25) which are formed along the side portions and are of a depth such that they extend substantially as far as the wall delimiting the cylinder-piston units, and which are closed by covers (20b-25b), the circuit (16) also comprising connecting ducts (29-30) between adjacent wells.

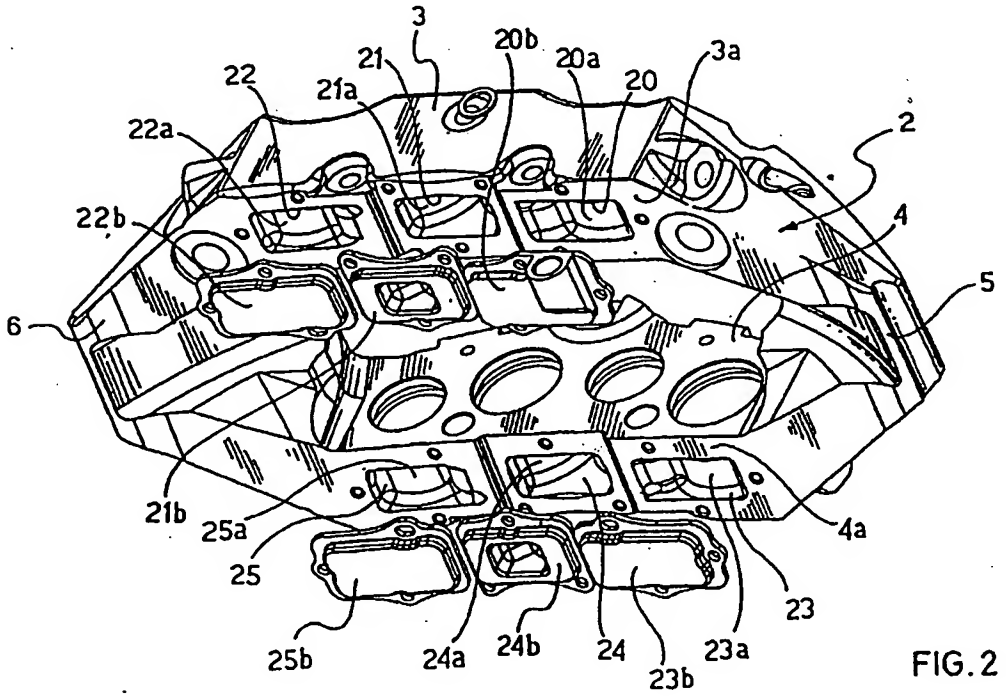

FIG. 2

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Description

[0001] The present invention relates to a caliper for disk brakes for motorcars, particularly high-performance cars, of the type comprising a body having two side portions and two transverse bridges connecting the two side portions, cylinder-piston units arranged along each side portion, and a circuit with an inlet and an outlet for a fluid for cooling the cylinder-piston units.

[0002] As is known, in calipers of the type specified, it is necessary to cool the cylinder-piston units so that the braking fluid does not reach excessively high temperatures which would lead to boiling of the braking fluid and consequently to loss of braking efficiency.

[0003] In known calipers, although the circuits for the cooling fluid used up to now for preventing the braking fluid from reaching excessively high temperatures are substantially satisfactory, they have recognized disadvantages.

[0004] For example, there are known calipers which have cooling-fluid circuits constituted by ducts formed in the caliper body during casting. These ducts extend along the side portions of the caliper and their path extends past the walls of the cylinder-piston units. However, this known solution requires the caliper bodies to be produced by casting with the disadvantage of structural complexity of the body.

[0005] Calipers which have fluid ducts, particularly air ducts, which extend along the cylinder-piston units in the vicinity of the region of contact with the braking pads have also been proposed. However, this latter solution is penalized by the poor heat-removal capacity typical of air, and requires very large ducts.

[0006] The technical solution of fitting, on the caliper body, elements having ducts through which a cooling liquid, rather than air, is intended to flow, however, have the disadvantage of requiring dimensions which are notably large, although smaller than those of solutions in which the cooling fluid is air.

[0007] The problem upon which the present invention is based is therefore to devise a caliper of the type specified which has structural and functional characteristics such as to satisfy the above-mentioned need to cool the cylinder-piston units, at the same time overcoming the disadvantages mentioned with reference to the prior art.

[0008] This problem is solved by a caliper of the type specified which is characterized in that the circuit for the fluid for cooling the cylinder-piston units comprises wells formed along at least one of the side portions, the wells being of a depth such that they extend substantially as far as the vicinity of the wall delimiting at least one of the cylinder piston units, and the wells being closed by covers, the circuit also comprising connecting ducts for putting the wells into fluid communication with one another.

[0009] Further characteristics and the advantages of the caliper according to the present invention will become clear from the following description of embodiments thereof given by way of non-limiting example and illustrated in the appended drawings, in which:

Figure 1 is a view showing a first embodiment of the caliper according to the invention, in longitudinal section,

Figure 2 is a perspective view of the caliper of Figure 1 with parts separated, viewed substantially from below and from the rear,

Figure 3 is a perspective view of the caliper of Figure 1 with parts separated, taken from above and from the rear,

Figure 4 is a perspective view of the caliper of Figure 1, with parts separated, taken from above and from the front,

Figure 5 is a shows a variant of the caliper of the preceding drawings, in longitudinal section,

Figure 6 is a perspective view of the caliper of Figure 5, taken from below.

[0010] With reference to the appended drawings, a caliper for a disk brake intended for a motorcar in general and for a high-performance motorcar in particular, is generally indicated 1.

[0011] The caliper 1 comprises a body 2 produced by machining from a solid semi-finished product, for example, from a rolled piece or from a forging of a suitable aluminium alloy known *per se*.

[0012] The body 2 has opposed elongate side portions 3 and 4 which are intended to be arranged along opposed sides of a braking band of the disk of a disk brake, not shown in the drawings.

[0013] The side portion 3 is disposed on the inner side and the side portion 4 is disposed on the outer side of the disk, in conventional manner.

[0014] Each of the side portions 3 and 4 has a lower peripheral wall 3a, 4a and an upper peripheral wall 3b, 4b.

[0015] Two transverse connecting bridges 5 and 6 connect the two side portions 3 and 4 to one another at their respective ends and on the side with the peripheral walls 3b and 4b. These connecting bridges 5 and 6 extend over the braking band of the disk.

[0016] The caliper 1 is of the fixed type and is intended to be fixed to an axle of the motor vehicle in conventional manner.

[0017] Cylinder-piston units are arranged along each of the two side portions 3 and 4. In the embodiment illustrated, four cylinder-piston units 7, 8, 9 and 10 are disposed in the side portion 3 and four cylinder-piston units 11, 12, 13 and 14 are disposed in the side portion 4.

[0018] The respective cylindrical seat of the cylinder of each cylinder-piston unit 7-14 in which the respective piston, not shown, can slide, is indicated 7a-14a.

[0019] A fluid circuit 15 for a braking fluid supplies all of the cylinder-piston units in conventional manner known *per se*.

[0020] According to the present invention, the caliper

1 comprises a fluid circuit 16 for a cooling fluid, for example water, which is provided for cooling the cylinder-piston units 7-14 and, more precisely, for cooling the braking fluid operating therein, in order to avoid the danger of boiling of the braking fluid.

[0021] The fluid circuit 16 for the cooling fluid has a path 17 which extends between two connectors 18 and 19 which constitute the inlet and the outlet for the cooling fluid.

[0022] Wells are formed in the lower walls 3a and 4a of the side portions 3 and 4, preferably by mechanical milling with machine tools. More precisely, according to the embodiment shown in Figures 1-4, three wells 20, 21, 22 and 23, 24, 25, respectively, are formed in each side portion 3 and 4, each in a position between respective adjacent cylinder-piston units.

[0023] Each well 20-25 has a substantially cusp-shaped end 20a-25a fitted between the respective adjacent cylinder-piston units so that the ends 20a-25a of the wells are close to the walls delimiting the cylindrical seats 7a-14a and hence are in a good heat-exchange relationship therewith.

[0024] The wells 20-25 are closed in a leaktight manner by respective covers 20b-25b, for example, by means of conventional screws, or by snap-closure means, or even by gluing, leaktightness being ensured by respective seals 20c-25c.

[0025] The well 21 and the well 24, which are deeper, are closed by the covers 21b and 24b. These have appendages 26 and 27 which project into the respective wells 21 and 24 defining respective spaces 28 of limited transverse dimensions.

[0026] The wells 20 and 21, as well as the wells 23 and 24 are in fluid communication with one another by means of respective ducts 29. The wells 21 and 22 as well as the wells 24 and 25 are in fluid communication by means of ducts 30.

[0027] The ducts 29 and 30 are produced by drilling along two intersecting axes.

[0028] The well 22 is put into fluid communication with the well 25 by means of a conventional duct, not shown, and the well 23 is put into communication, by means of a further duct, not shown, with a threaded hole 31, opening into the inner side of the side portion 3. The connector 19 is screwed into the threaded hole 31 on the outside of the caliper. A threaded hole 32 is formed in the cover 20b. This hole 32 which, in practice, is on the outside of the caliper in the same manner as the threaded hole 31, houses the connector 18 which is screwed therein.

[0029] It is clear at this point that the circuit 16 for the cooling liquid is constituted by the spaces 28 formed by the covers 20b-25b with the ends of the respective wells 20-25, by the ducts 29 and 30, and by the transverse connecting ducts (not shown) which put the well 22 into communication with the well 25 and the well 23 into communication with the threaded hole 31.

[0030] All of the covers 20b-25b are made of aluminium. The appendages 26 and 27 formed integrally with the respective covers 21b and 24b are also made of aluminium.

[0031] In operation, the cooling fluid which passes along the path 17 of the circuit 16 flows through the ducts, close to the cylinder-piston units, ensuring that the temperature of the braking fluid is kept below its boiling points.

[0032] With reference to the embodiment of Figures 5 and 6, it will be noted that the circuit for the fluid for cooling the cylinder-piston units comprises, for each side portion 3 and 4, two wells, indicated 33 and 34, closed by respective covers 33b and 34b with seals 33c and 34c. The wells 33 and 34 of the side portion 4 are shown in Figure 6 without the respective covers. The ends 35 and 36 of the well 33 and of the well 34, respectively, are shaped so as to be close to the peripheral walls of the cylindrical seats of the cylinder-piston units and the respective covers 33b and 34b are shaped, for example, by drawing, so as to reproduce the shapes of the ends 35 and 36. A space 37 formed between the covers 33b and 34b and the ends 35 and 36 of the respective wells constitutes part of the circuit for the cooling fluid.

[0033] The connectors 18 and 19 which, in the embodiment of Figures 5 and 6, are indicated 18a and 19a, are advantageously positioned in the vicinity of the centreline x-x of the caliper.

[0034] The main advantage of the caliper according to the present invention lies in its reliability, as well as in maximum strength.

[0035] Naturally, in order to satisfy contingent and specific requirements, an expert in the art may apply to the above-described caliper many modifications and variations all of which, however, are included within the scope of protection of the invention as defined by the following claims.

Claims

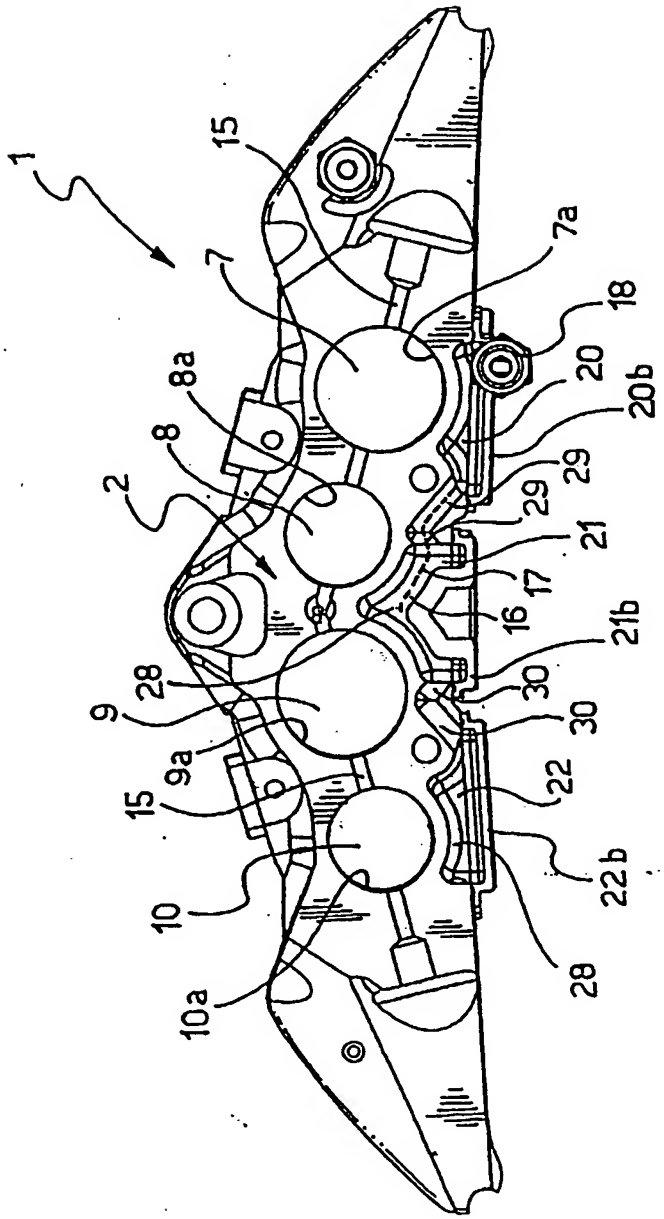
1. A caliper for a disk brake for motorcars, of the type comprising a body (2) having two side portions (3, 4) and two transverse bridges (5, 6) connecting the two side portions, cylinder-piston units arranged along each side portion, and a circuit (16) with an inlet and an outlet (18, 19) for a fluid for cooling the cylinder-piston units, characterized in that the circuit (16) for the fluid for cooling the cylinder-piston units comprises wells (20-25) formed along at least one of the side portions (3, 4), the wells being of a depth such that they extend substantially as far as the vicinity of the wall delimiting at least one of the cylinder-piston units, and the wells being closed by covers (20b-25b), the circuit (16) also comprising connecting ducts (29, 30) for putting the wells (20-25) into fluid communication with one another.

2. A caliper according to Claim 1, characterized in that at least one (24b) of the covers bears an appendage (26, 27) extending into the respective well (24) in order to occupy a predominant portion thereof.

3. A caliper according to Claim 2, characterized in that the appendages (26, 27) of the covers are constituted by deformations of the covers produced by drawing.

4. A caliper according to Claim 2, characterized in that the covers and the appendages are made of aluminium.

5. A caliper according to Claim 1, characterized in that the body (2) is formed by mechanical machining from a solid semi-finished product made of aluminium alloy, and in that the wells and the ducts are produced by milling and by drilling, respectively.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7a
18
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20b
8a
8
2
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22b
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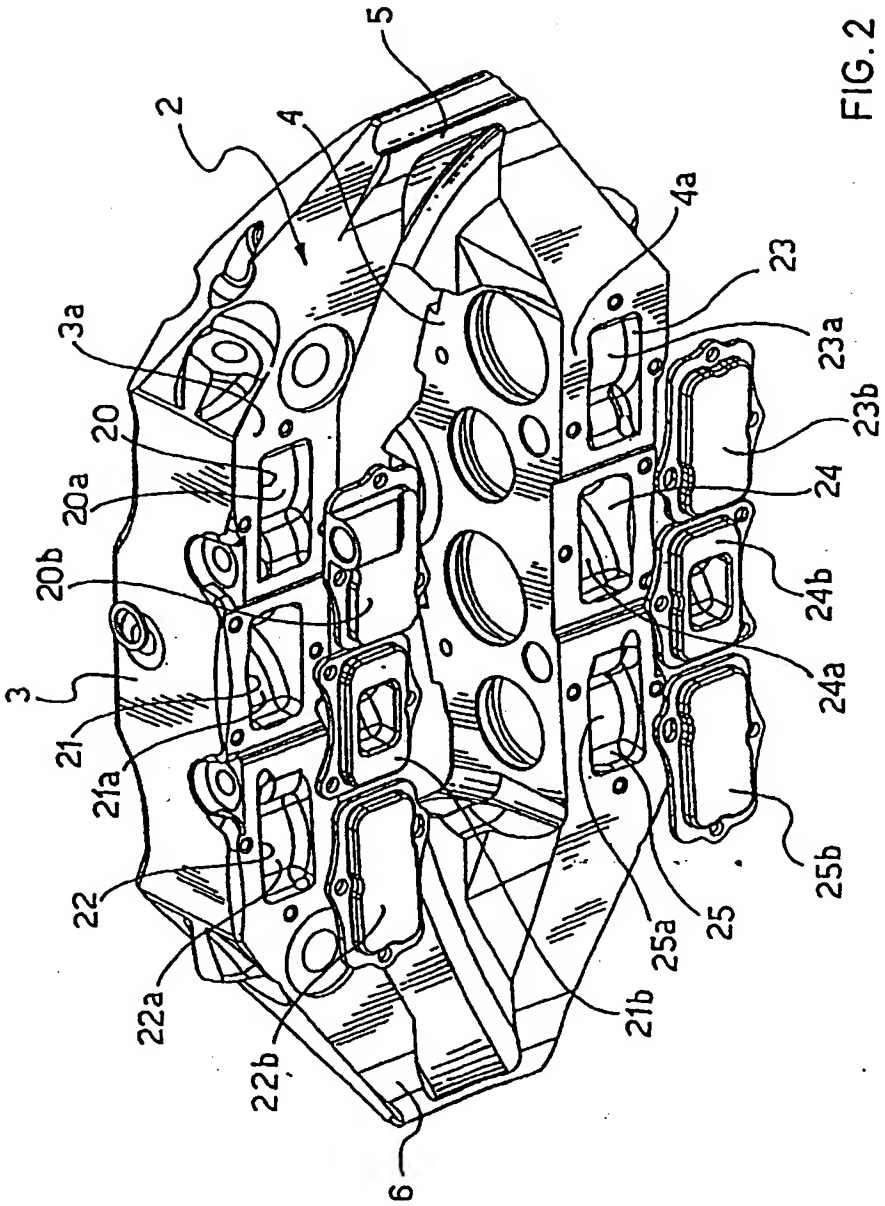
10a

FIG. 1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4a
23
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20a
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25a
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25b

FIG. 2

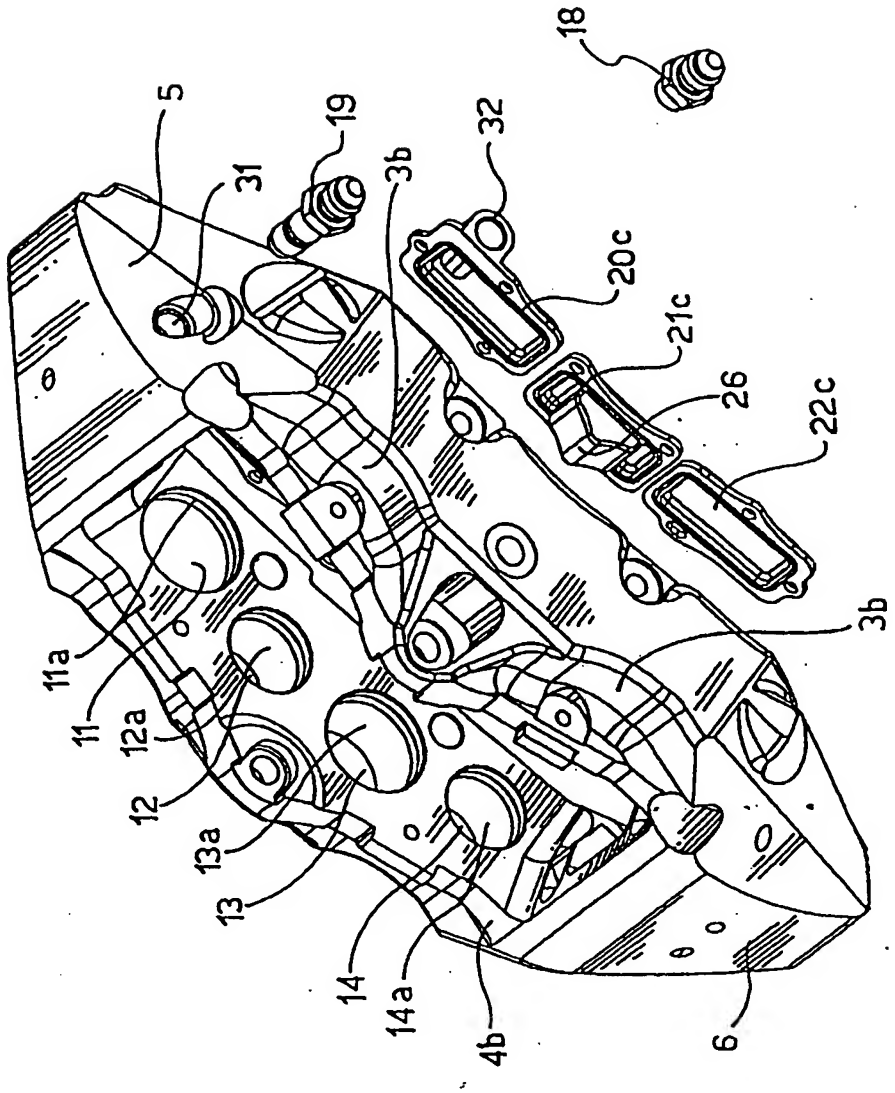

FIG.3

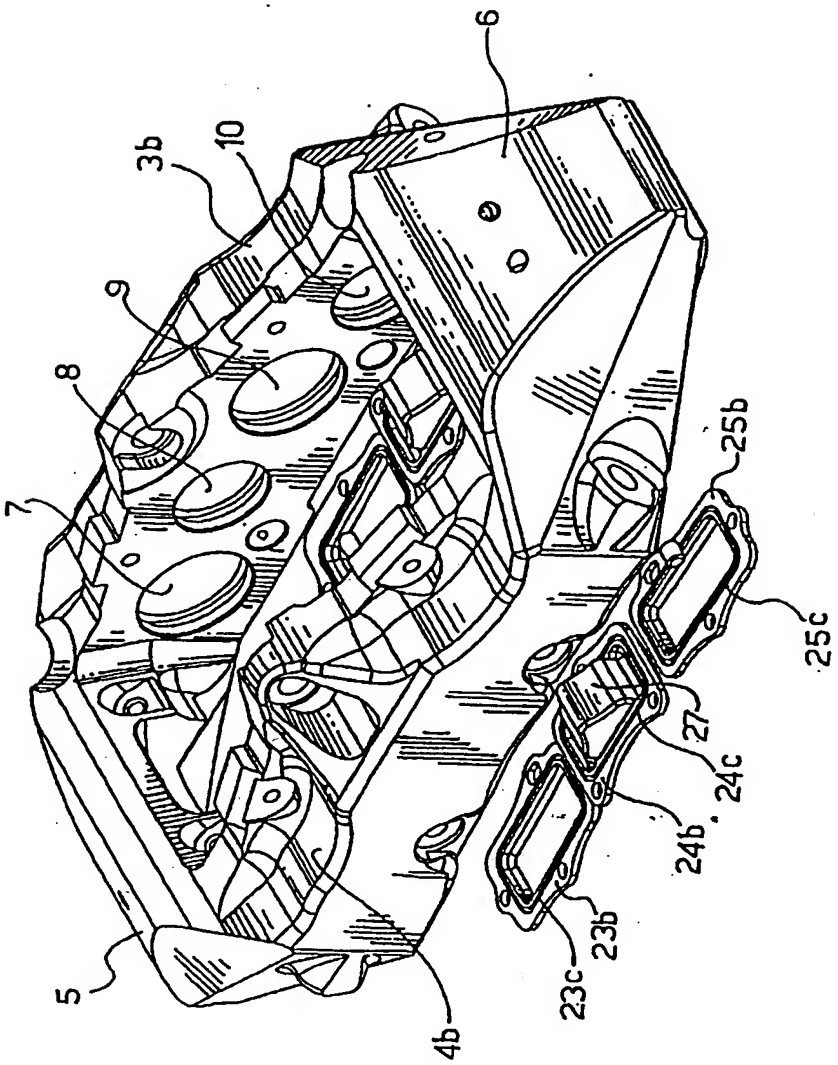

FIG. 4

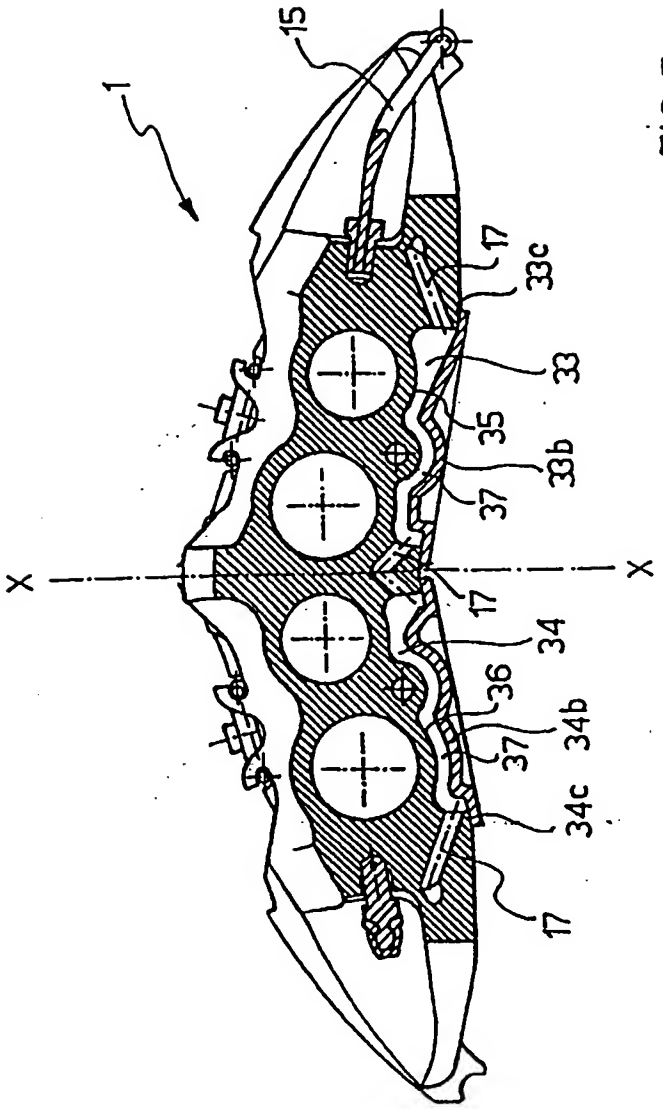

FIG.5

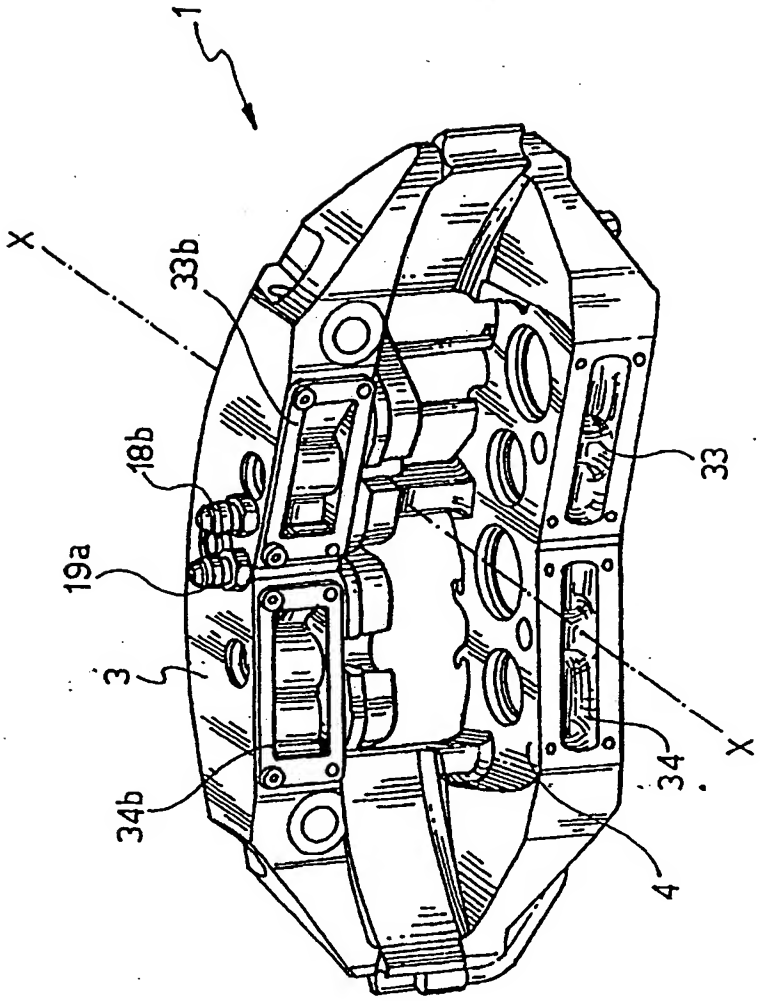

FIG.6

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EUROPEAN SEARCH REPORT

Application Number
EP 99 83 0673

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 5 558 183 A (WAY ASHLEY) 24 September 1996 (1996-09-24) * abstract; figures 1-3 * * column 3, line 24 - line 26 * * column 4, line 22 - line 28 * ---	1,4,5	F16D65/853
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7) F16D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	16 February 2000	Gertig, I

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16-02-2000

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